

Title	Comparison of VNEM to Measured Data from Ringhals Unit 3 (Phase 3)
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Abstract	<p>1. PWR</p> <p>Comparisons have been made of a PWR core simulator CYGNUS with VNEM neutronics module to the measured data obtained from Ringhals unit 3 NPP through the cycle 1A (core average burnup = 0 through 10,507MWD/MT).</p> <p>The results can be summarized as:</p> <p>core eigenvalue = 0.99937 +/- 0.00086 before intermediate 5 months shutdown</p> <p>core eigenvalue = 0.99647 +/- 0.00029 after intermediate 5 months shutdown</p> <p>The reason of core eigenvalue drop after the intermediate shutdown is estimated to be the build-up of fissile elements during the long shutdown. A calculation model to track some important isotopes in addition to Xe135 and Sm149 (these isotopes are tracked in the present version of CYGNUS) has to be implemented.</p> <p>As for the comparison of the neutron detector readings, the agreement was excellent throughout the cycle 1A as observed in Phase 1 and 2 (2008, 2009).</p> <p>The burnup tilt effect was not observed during the cycle 1A. The verification of the burnup tilt model of CYGNUS will be performed in the next phase of the project.</p> <p>2. BWR</p> <p>A preliminary 2D numerical benchmarking was performed for BWR cores. The problems were generated imitating the NEACRP MOX PWR 2D benchmark problems. The results of comparisons of VNEM to a reference transport code (FCM2D), based on the method of characteristics, were as good as those obtained in the case of PWR cores for similar benchmarking.</p>
Key words	CYGNUS, VNEM, Ringhals, unit 3, PWR, neutron detector, keff, BWR, benchmark, IACIP: NKS_R_2008_61